IWXXM and WXXM Update

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By: Aaron Braeckel

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Aviation Information World – Forecasting the Future

Weather Data Model Evolution

IWXXM & WXXM are key to concepts and applications in ICAO, WMO, and NextGen/SESAR

- The World Meteorological Organization (WMO) establishes the basis for global MET/Weather information exchange
- ICAO establishes the basis for Meteorological Service for International Air Navigation (ICAO Annex 3)
- Open Geospatial Consortium (OGC) provides the forum for establishing open standards for exchanges of geospatial referenced information
- FAA and EUROCONTROL develop encoding for exchanging Next-generation aviation weather products
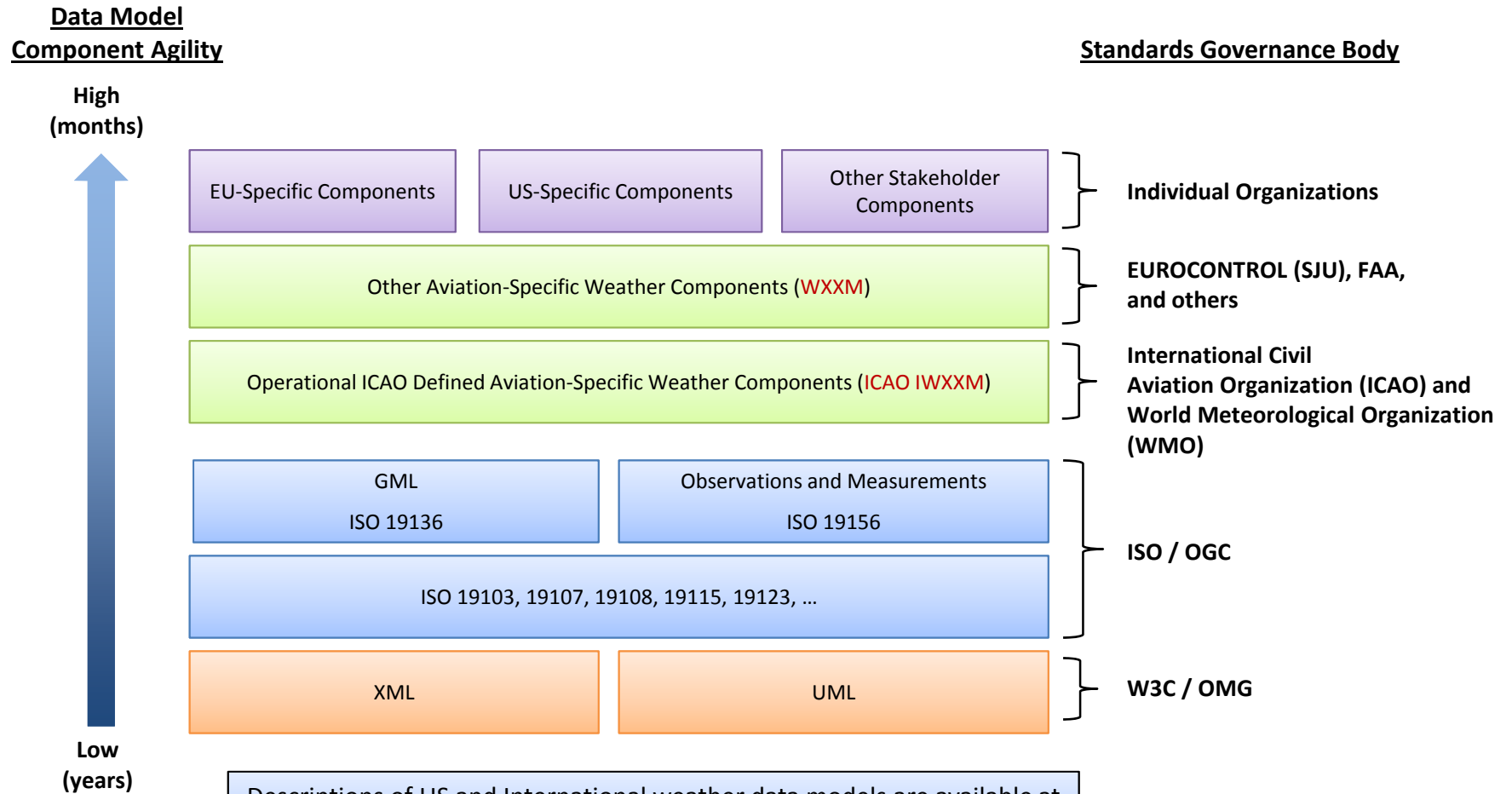
IWXXM and WXXM

IWXXM

- Strict and complete representation of ICAO Annex 3 products – e.g, METAR, SPECI, TAF, SIGMET (**regulated** products)
- Business rules strongly enforced
- Managed by ICAO and WMO
- Updated on roughly the same time scale as ICAO Annex 3 (every two years)

WXXM

- Next-generation aviation and weather data representations
- General purpose, reusable data types (aerial report, profile, trajectory, area forecast, point forecast, etc.)
- Open content policy
- Many products and data types beyond ICAO Annex 3
- Managed by Eurocontrol, FAA, and other partners

Weather Data Models

Data Model Component Agility

Standards Governance Body

High (months)

EU-Specific Components	US-Specific Components	Other Stakeholder Components	**Individual Organizations**

Other Aviation-Specific Weather Components (WXXM) — **EUROCONTROL (SJU), FAA, and others**

Operational ICAO Defined Aviation-Specific Weather Components (ICAO IWXXM) — **International Civil Aviation Organization (ICAO) and World Meteorological Organization (WMO)**

GML ISO 19136	Observations and Measurements ISO 19156

ISO 19103, 19107, 19108, 19115, 19123, …

ISO / OGC

XML	UML

W3C / OMG

Low (years)

Descriptions of US and International weather data models are available at
https://wiki.ucar.edu/display/CSSWX/Weather+Data+Models

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ICAO Annex 3

18

APPENDIX 3. TECHNICAL SPECIFICATIONS RELATED TO METEOROLOGICAL OBSERVATIONS AND REPORTS

(See Chapter 4 of this Annex.)

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2. GENERAL CRITERIA RELATED TO METEOROLOGICAL REPORTS

2.1 Format of meteorological reports

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2.1.3 **Recommendation.**— *METAR and SPECI should be disseminated, under bilateral agreements between States in a position to do so, in the WMO BUFR code digital form, in addition to the dissemination of the METAR and SPECI in accordance with 2.1.2.*

Note.— The BUFR code form is contained in WMO Publication No. 306, Manual on Codes, Volume I.2, Part B — Binary Codes.

2.1.4 METAR and SPECI if disseminated in digital form shall be formatted in accordance with a globally interoperable information exchange model and shall use extensible markup language (XML)/geography markup language (GML).

2.1.5 METAR and SPECI if disseminated in digital form shall be accompanied by the appropriate metadata.

Note.— Guidance on the information exchange model, XML/GML and the metadata profile is provided in the Manual on the Digital Exchange of Aeronautical Meteorological Information (Doc 10003).
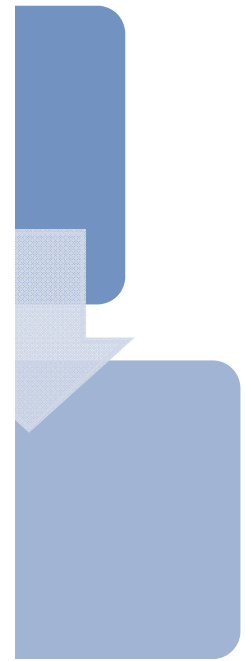
ICAO Annex 3 / IWXXM Data Products

- METAR/SPECI
- TAF
- SIGMET
- VA Advisory
- TC Advisory
- AIRMET

- Significant Weather (SigWx)
- Local MET/Special Report
- GAMET
- Aerodrome warning
- Wind Shear warning/alert
- Air report

IWXXM 1.x
IWXXM 2.x

Note: Not all ICAO Annex 3 products will necessarily be implemented in IWXXM

IWXXM Regulation
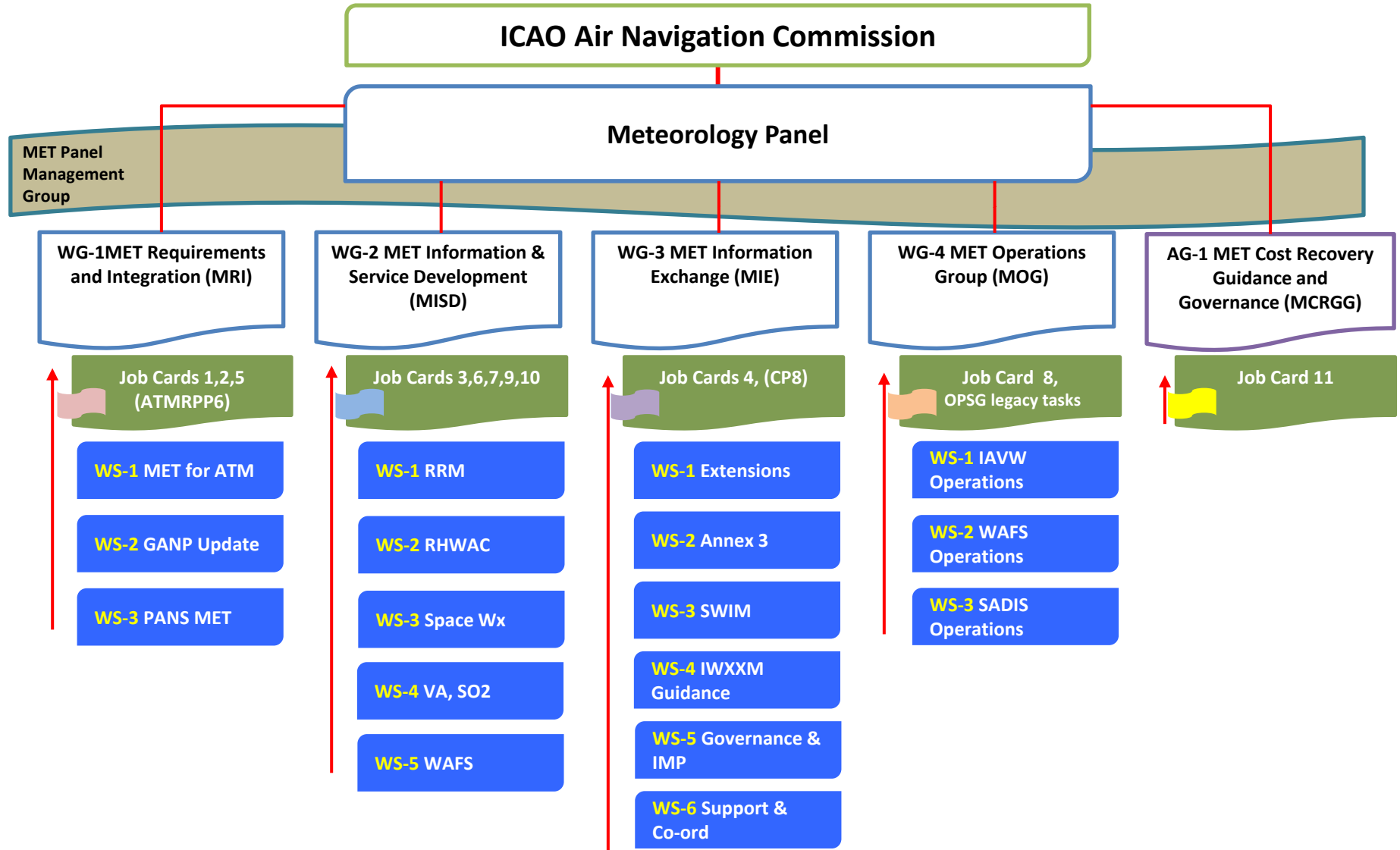

ICAO (MET Panel) Responsibility

Aviation regulation and requirements

WMO (TT-AvXML) Responsibility

Weather regulation and technical implementation

ICAO MET Panel Structure

ICAO Air Navigation Commission

Meteorology Panel

MET Panel Management Group

WG-1 MET Requirements and Integration (MRI)	WG-2 MET Information & Service Development (MISD)	WG-3 MET Information Exchange (MIE)	WG-4 MET Operations Group (MOG)	AG-1 MET Cost Recovery Guidance and Governance (MCRGG)
Job Cards 1,2,5 (ATMRPP6)	Job Cards 3,6,7,9,10	Job Cards 4, (CP8)	Job Card 8, OPSG legacy tasks	Job Card 11
WS-1 MET for ATM	WS-1 RRM	WS-1 Extensions	WS-1 IAVW Operations	
WS-2 GANP Update	WS-2 RHWAC	WS-2 Annex 3	WS-2 WAFS Operations	
WS-3 PANS MET	WS-3 Space Wx	WS-3 SWIM	WS-3 SADIS Operations	
	WS-4 VA, SO2	WS-4 IWXXM Guidance		
	WS-5 WAFS	WS-5 Governance & IMP		
		WS-6 Support & Co-ord		

ATEC

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IWXXM Transition

ICAO States are in the midst of a transition from Traditional Alphanumeric Codes (TAC) to XML/IWXXM

Few ICAO States produce XML natively, and must instead convert TAC produced by sensors or systems to XML during the transition period

TAC formats are semi-open text formats which are difficult to parse completely in all circumstances. Therefore outside of special cases TAC -> XML is often a lossy conversion

XML can be converted to TAC (and other forms – HTML web pages, JSON, images, etc.) relatively easily

Bi-directional conversion (TAC -> XML -> TAC) should be avoided as it is a lossy process

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IWXXM Policy and Guidance

ICAO WG-Meteorological Information Exchange (MIE) is developing guidance for ICAO States when implementing IWXXM (*Guidelines for the Implementation of OPMET Data Exchange using IWXXM* - Workstream 4). Work was completed in June of 2016
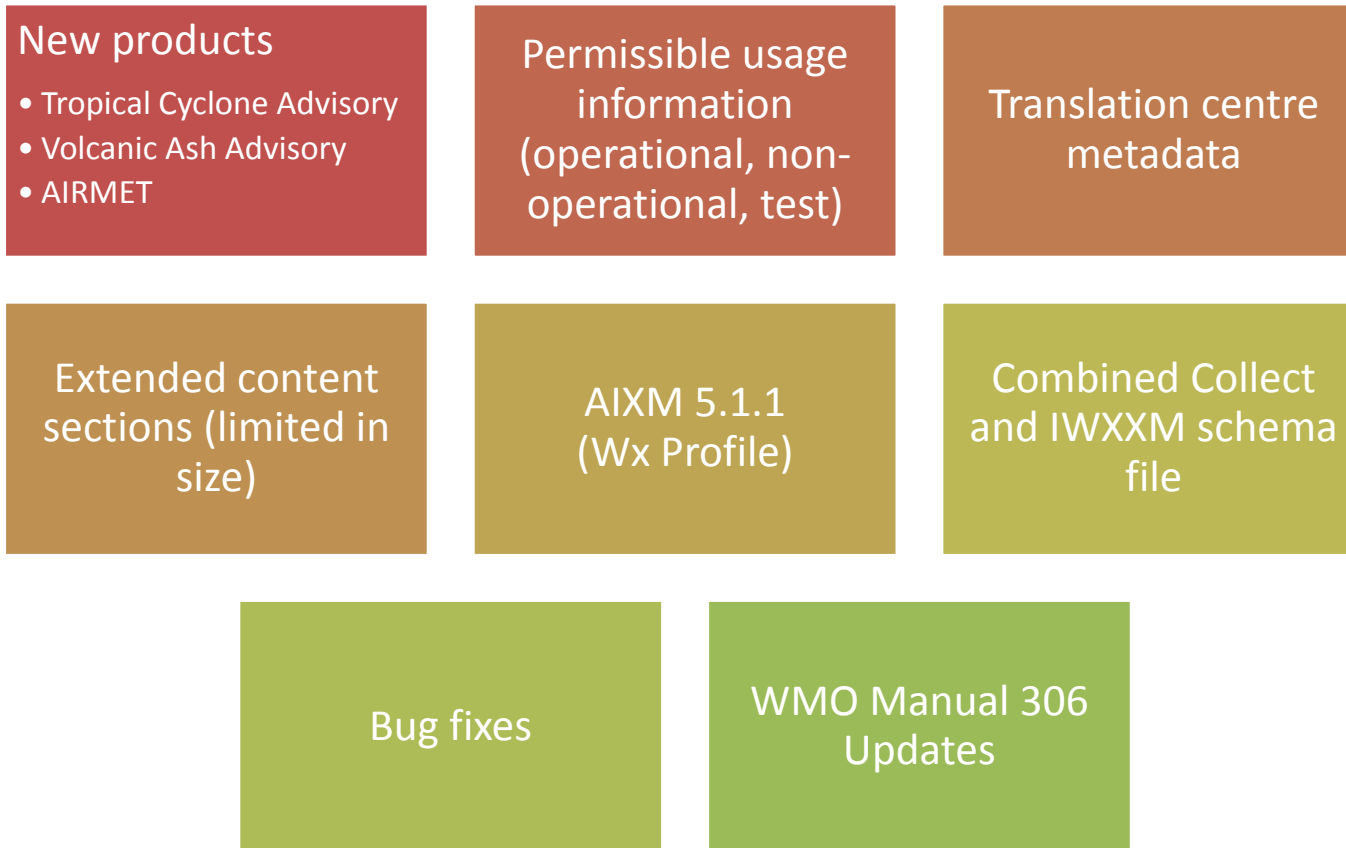
Guidance in this document and elsewhere continues to be developed by WG-MIE, including topics such as:

- Who should perform validation

- How to handle invalid or partially translated messages

- The expected behavior of translation centres

- …

IWXXM 2.0

Released August 2016

New products
- Tropical Cyclone Advisory
- Volcanic Ash Advisory
- AIRMET

Permissible usage information (operational, non-operational, test)

Translation centre metadata

Extended content sections (limited in size)

AIXM 5.1.1 (Wx Profile)

Combined Collect and IWXXM schema file

Bug fixes

WMO Manual 306 Updates

IWXXM 2.0 Validation

Not all XML validation tools produce exactly the same results. To remove ambiguity and provide authoritative answers, WMO is providing XML validation tools:

- An ICAO/WMO XML schema bundle

- A command-line tool/library which provides authoritative validation for ICAO/WMO XML schemas ([Crux](#))

- A web-based user interface for validating XML messages with Crux

Upcoming Releases

IWXXM 2.1 release – Spring 2017

- Address user feedback and bug fixes

IWXXM 3.0 release – Summer 2018

- Timeline synchronized with ICAO Annex 3 / WMO No. 49 updates
- Address user feedback, other changes to be determined

WXXM 2.1 release as needed

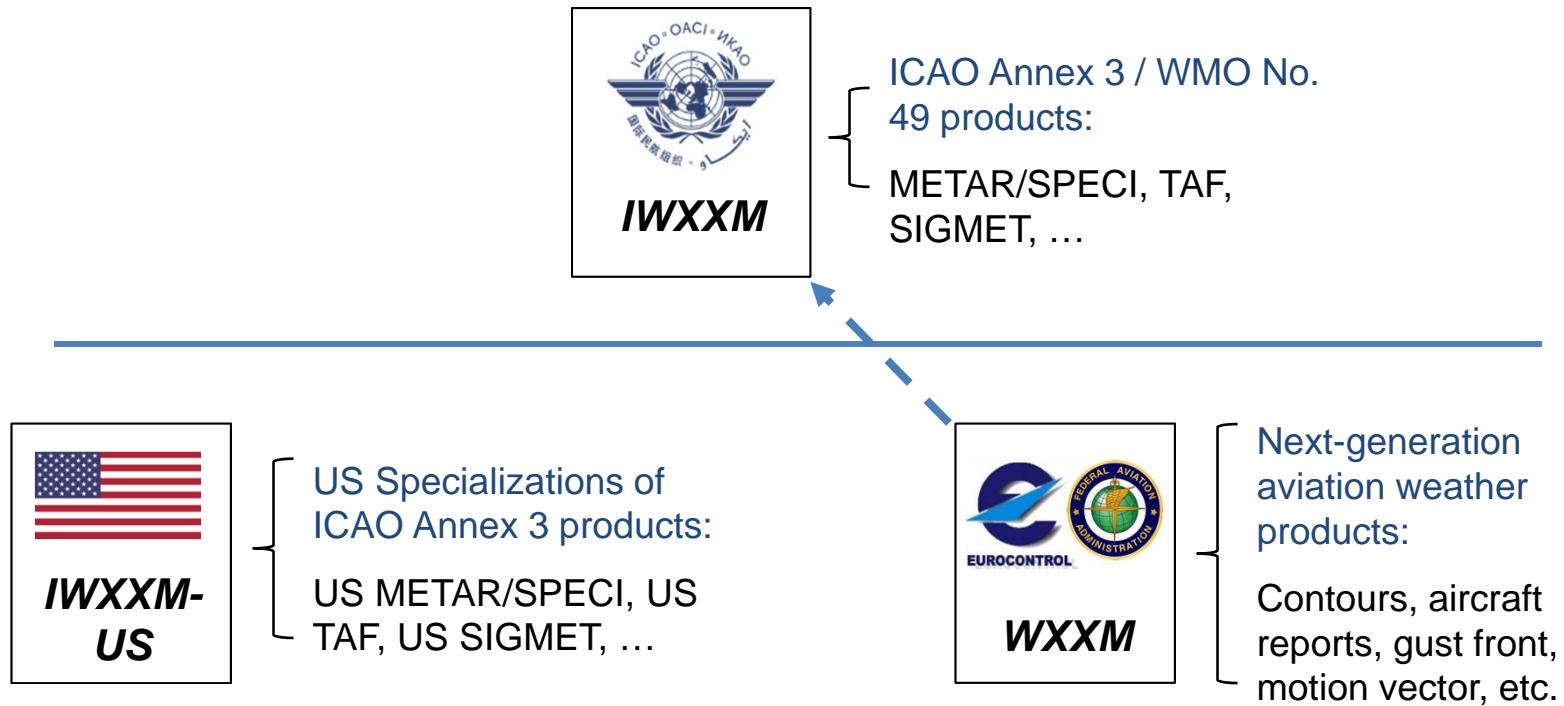- Released as bug fixes or new products are required

IWXXM Potential Future Work

- Simplification

- XML Schema 1.1

- Additional ICAO Annex 3 products

- Compression

Weather Standards Correlation

ICAO Annex 3 / WMO No. 49 products:

METAR/SPECI, TAF, SIGMET, …

IWXXM

US Specializations of ICAO Annex 3 products:

US METAR/SPECI, US TAF, US SIGMET, …

IWXXM-US

Next-generation aviation weather products:

Contours, aircraft reports, gust front, motion vector, etc.

WXXM

Products feed from WXXM to IWXXM over time

ICAO Products in WXXM

WXXM has previously implemented ICAO products before they were officially incorporated into IWXXM

WXXM 1.x – a number of ICAO Annex 3 products

WXXM 2.0 – AIRMET, VA Advisory, SigWx

Products in WXXM should be considered deprecated and should no longer be used when they become available in an official form in IWXXM

Conclusion

IWXXM and WXXM are being integrated into operational systems

IWXXM and WXXM are being utilized within the United States (FAA CSS-Wx, FAA NWP, and NOAA NextGen IT Services) and are being tested in operational contexts internationally (ICAO/WMO)

IWXXM will be an ICAO Recommended Practice for the exchange of METAR/SPECI, TAF, SIGMET, AIRMET, VA Advisory and TC Advisory starting in November 2016

IWXXM content and ICAO Standard status was planned for November 2018 but is a subject of discussion by the MET Panel

IWXXM is a critical part of the meteorological component of ICAO SWIM (MET-SWIM)

Contact Information

Questions and comments on IWXXM may be directed to cbs-tt-avxml@wmo.int

Aaron Braeckel

FAA NextGen Weather Systems

National Center for Atmospheric Research (NCAR)

braeckel@ucar.edu